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perhaps, the same mechanical basis as Helmholtz's explanation, it seems not amiss to approach it in this way. An attempt is being made at a mathematical treatment.

C. C. TROWBRIDGE,
Secretary.

DISCUSSION AND CORRESPONDENCE.

HIGHER AND LOWER.

TO THE EDITOR OF SCIENCE: In the *American Naturalist* for June, on page 413, L. J. C. takes exception to the custom of referring to animals as 'higher' and 'lower,' on the ground that these terms tend to give the student an idea that the vertebrate affinities lie in a direct chain, rather than forming a complicated, branching system.

This criticism will strike some as a little captious since the terms do not imply a direct connection, but merely that some animals are on a higher plane than others, just as the dwellers on the fifth floor of an apartment house are higher than those on the fourth floor. The terms generalized and specialized fail to convey the idea intended because a highly specialized animal may be low in the scale of life. The sloth is more specialized than the monkey, but it would naturally be termed a lower animal; thus though what we call the 'higher' animals are, as a rule, more specialized than the 'lower' forms, they are by no means invariably so. To revert to the apartment house it may be said that a family on the fifth floor might be related to one on the fourth and another on the sixth and yet, as a whole, the fifth floor people would be higher than those below.

F. A. L.

A DENIAL.

TO THE EDITOR OF SCIENCE: In a circular sent out by The Macmillan Company advertising one of their recent publications, the assertion is gratuitously made that I 'uphold Wallace's position.' Kindly allow me the space to deny the statement and to explain that it arose first from a misapprehension, which was later compounded by a clerical error—not mine.

HUBERT LYMAN CLARK.

SPECIAL ARTICLES.

THE FISHES OF PANAMA.

IN the Zoological Club of Indiana University in 1885 or 1886 President D. S. Jordan gave a résumé of the facts known at that time concerning the relation of the marine faunas on the two sides of Panama. It was jokingly remarked at that time that at the rate of progress the canal might be finished by 1900 and that zoologists would have to bestir themselves to record the faunas as they exist before the Panama canal would mix things up. It is now 1905 and the canal is not finished. In the meantime the marine faunas have been dealt with by

1. GREGORY, L. W.: 'Contributions to the Palæontology and Physical Geology of the West Indies,' *Quart. Journ. Geol. Soc.*, Vol. 4, 1895, pp. 255-312.

2. FAXON, WALTER: 'The Stalk-eyed Crustacea,' *Mem. Mus. Comp. Zool.*, Harvard College, Vol. XVIII., 1895, pp. 1-292.

3. GILBERT, C. H., and STARKS, EDWIN C.: 'The Fishes of Panama Bay,' *Mem. Cal. Acad. Sci.*, Vol. IV., pp. 1-226.

Gilbert and Stark's conclusions are that:

"The ichthyological evidence is overwhelmingly in favor of the existence of a former open communication between the two oceans, which must have been closed at a period sufficiently remote from the present to have permitted the specific differentiation of a very large majority of the forms involved." They found that 'of the 82 families of fishes represented at Panama all but 3 (Cerdalidæ, Cirhitidæ and Nematestiidæ) occur also on the Atlantic side of Central America; while of the 218 genera of our Panama list, no fewer than 170, are common to both oceans.' Fifty-four out of a total of 374, or 144 per cent., of the Pacific coast species are identical with Atlantic coast species.

I have just finished a consideration of the geographical distribution of the freshwater fishes of tropical America and Patagonia as applied to the Archihelenis-Archiplata theory of von Ihering. The details will appear in one of the volumes of the Hatcher reports of Princeton University. The evidence there collected indicates that the Pacific slope fauna